Digital Mapping Techniques '13
Association of American State Geologists
United States Geological Survey

The following was presented at DMT'13
(June 2-5, 2013, Golden, CO).

The contents are provisional and will be
superseded by a paper in the
DMT'13 Proceedings.

See also earlier Proceedings (1997-2012)
http://ngmdb.usgs.gov/info/dmt/

Natural Resources Canada

Automating Tasks for Map Production and Data Dissemination

by Vic Dohar

DIGITAL MAPPING TECHNIQUES 2013
GOLDEN, CO
JUNE 2-5, 2013

Natural Resources Canada Ressources naturelles Canada

Canada

Presentation Goals

- Overview of geological map production at the Geological Survey of Canada

- Tasks that we have automated to support map production and publication outputs

- Provide ideas and inspiration for automation

Natural Resources
Canada

Ressources naturelles
Canada

Canada

Background

- GSC has six regional offices, cartography and GIS sections

- Using ESRI software for map production since the early 1990's

- Recent integration with Geological Map Flow

Geological Map Flow

- GMF is a project of the GEM Program (Geo-mapping for Energy and Minerals)
  - The Government of Canada is investing $100 million over five years (2008-2013)
  - GEM will focus mainly on mapping the Arctic and will use <u>modern geological methods and standards</u> to identify the potential for energy and mineral resources

- Support the implementation of a streamlined and robust procedure for the collection, the preparation and the dissemination of geological information

GMF Components

MAJORITY OF WORK

1. Field Data Collection – field work and surveys, GanFeld mobile/tablet application, aerial photography interpretation, analysis

2. Geodatabase Management – integrating field data and the interpreted geological map with data models and common science language

3. Data Dissemination – map production and digital ready products for Canadian Geoscience Map publications

Data Dissemination

- Major challenges:
  - Adapting to new process and methodologies
    - Passing ownership and management of geological data to geologist
    - Elimination of print product
  - Adapting to new software technologies
    - Transition from Workstation to ArcMap
    - Requires new procedures and documentation
    - New symbols and agreement on standard
    - Re-writing programs and scripts
  - Ensure everyone is on board

Natural Resources Canada   Ressources naturelles Canada

Canada

- No more printing. Only PDF and digital data.

Publication Workflow

- ## Keeping it simple!

CGM Publication (Digital Product)

SDE geodatabase or file geodatabase. SDE requiresversions to be reconciled to publication version

Specific fields eliminated, tables processed

Geology Project SDE Geodatabase

Geology Dissemination Geodatabase

SHP — Shapefiles of simple features in geodatabase

Cartographic features (e.g. border, annotation topographic base)

Carto Elements

XML — XML Workspace Document of geodatabases

Generic readme.rtf file, fonts and style files

CGM requirements (e.g. NTS index, location map)

CGM Framework

PDF — Publication info, data model document PDFs

Map document for editing geology, symbolizing, map surround, and legend

CGM MXD

PDF — GeoPDF (no layers)

WORK FLOWS

- Editing, geological map production
- Geoprocessing tools
- Publishing (PDF)

Natural Resources Canada

Ressources naturelles Canada
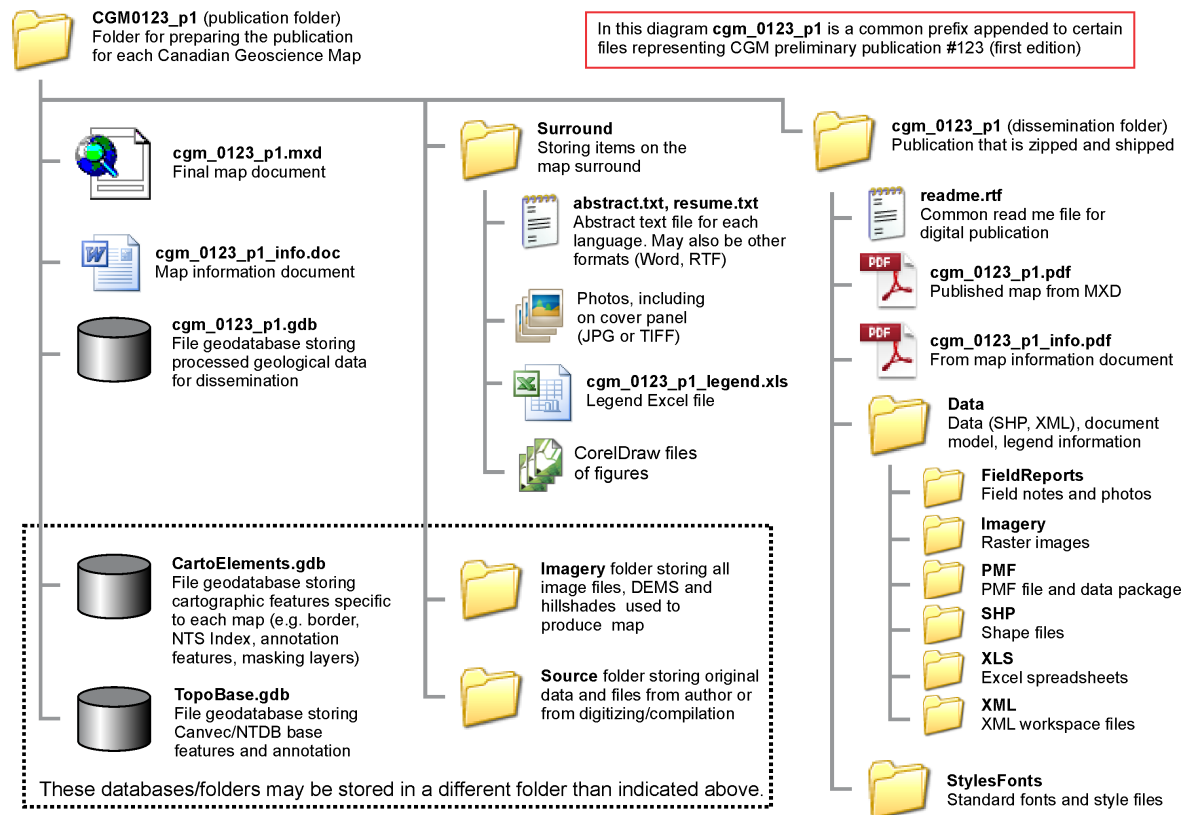
Canadä

Automation - Python/VB

- Establishing the project workspace
- Create map border and UTM grid for publication
- Extract topographic base data
- Map layout management wizards
- Create publication/disseminate data

Establishing Workspace

- **Simple python script to create the required folders and files**

CGM0123_p1 (publication folder)
Folder for preparing the publication
for each Canadian Geoscience Map

In this diagram **cgm_0123_p1** is a common prefix appended to certain files representing CGM preliminary publication #123 (first edition)

cgm_0123_p1.mxd
Final map document

cgm_0123_p1_info.doc
Map information document

cgm_0123_p1.gdb
File geodatabase storing
processed geological data
for dissemination

Surround
Storing items on the
map surround

abstract.txt, resume.txt
Abstract text file for each
language. May also be other
formats (Word, RTF)

Photos, including
on cover panel
(JPG or TIFF)

cgm_0123_p1_legend.xls
Legend Excel file

CorelDraw files
of figures

cgm_0123_p1 (dissemination folder)
Publication that is zipped and shipped

readme.rtf
Common read me file for
digital publication

cgm_0123_p1.pdf
Published map from MXD

cgm_0123_p1_info.pdf
From map information document

Data
Data (SHP, XML), document
model, legend information

FieldReports
Field notes and photos

Imagery
Raster images

PMF
PMF file and data package

SHP
Shape files

XLS
Excel spreadsheets

XML
XML workspace files

CartoElements.gdb
File geodatabase storing
cartographic features specific
to each map (e.g. border,
NTS Index, annotation
features, masking layers)

TopoBase.gdb
File geodatabase storing
Canvec/NTDB base
features and annotation

Imagery folder storing all
image files, DEMS and
hillshades used to
produce map

Source folder storing original
data and files from author or
from digitizing/compilation

StylesFonts
Standard fonts and style files

These databases/folders may be stored in a different folder than indicated above.

Natural Resources
Canada

Ressources naturelles
Canada

Canada

Creating Map Border

- Custom latitude and longitude border with UTM grid coordinates

- Features created based on publication scale

- Uses Maplex labelling for coordinates

- Creates other features (e.g. neatline polygon)

Creating Map Border

Base Data Sources

- Canadian National Topographic System (NTS)
  - 1:50,000 (+13,400 tiles/sheets, CanVec)
  - 1:250,000 (+1500 tiles/sheets, NTDB - National Topographic Database)
- National Atlas data for smaller scale maps
- Data stored in SDE geodatabase
- Also available as shape files per tile/sheet

Base Extraction Script

- Use neatline from border to clip base features into a file geodatabase

  ⊟ 🧰 Topographic Base Preparation Tools 10_1.tbx
  📜 A-Topographic Base Extractor 50K
  📜 B-Topographic Base Extractor 250K
  📜 C-Code Approximate Contours
  📜 D-Process Indefinite Water with Surficial Geology
  📜 E-Delete Empty Layers in Table of Contents
  📜 F-Delete Empty Feature Classes in Geodatabase

- Processing of contours, creating shoreline from water bodies, bedrock/surficial specific tasks

- Template/MXD with defined layers and symbology

- Labelling of point features for all base text (contours, elevations, hydrology, base text)

- Remove empty feature classes and layers from TOC

Natural Resources Canada   Ressources naturelles Canada

Canada

Topographic Base Sample

Map Production

- Template/MXD containing graphics for CGM
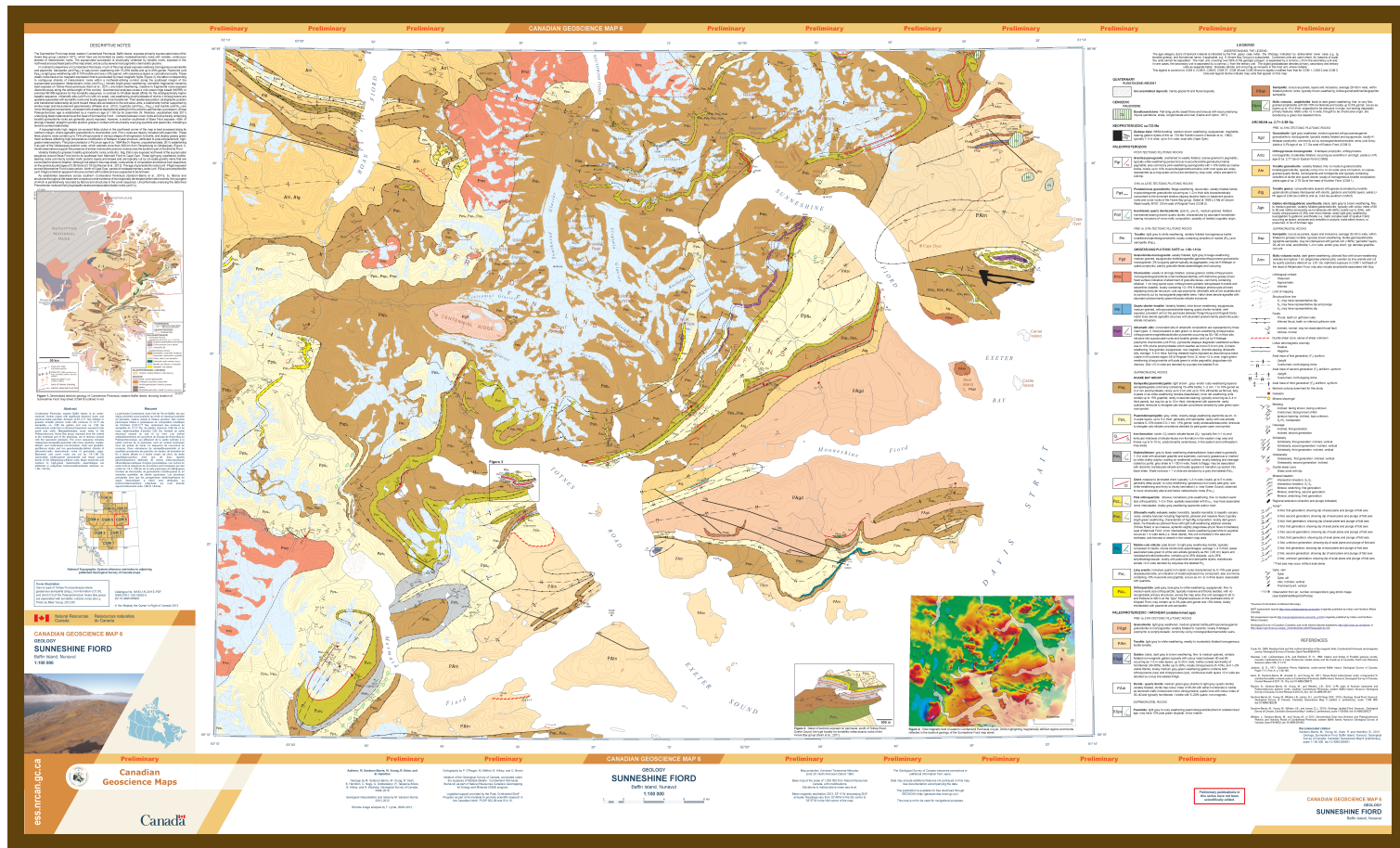
Map Layout Management

- Application manages surround graphic elements
  - Placement and rotation of main map data frame
  - Position and size map surround elements (default location or relative to other elements)
  - Corrects drawing order
  - Updates map titles and citation
  - Adjust page size to fit map, surround and legend
- Guarantees adherence to design specifications
- Achieved by application using graphic properties: Element Name

Natural Resources Canada   Ressources naturelles Canada

Canada

Graphic Element Properties

- **Each graphic element has a unique name**
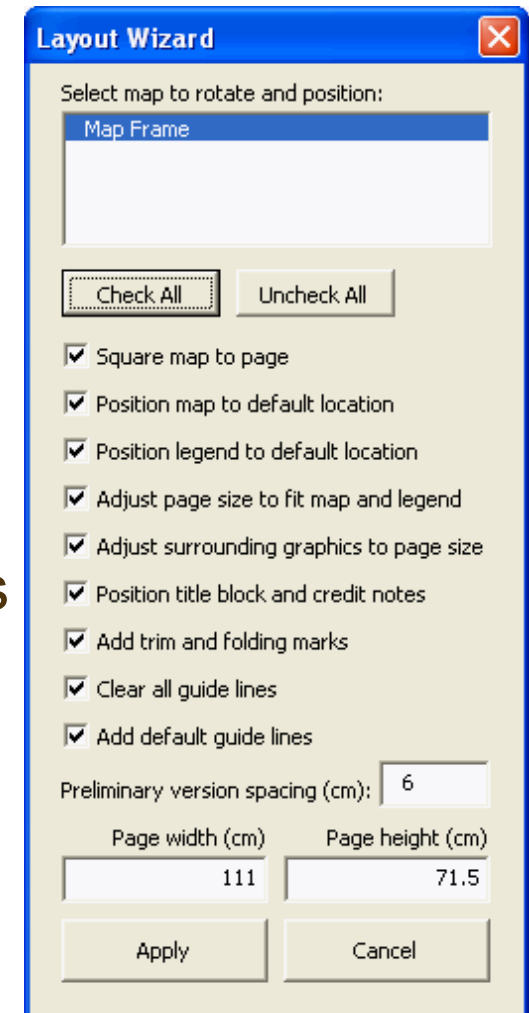
Layout Wizard

- VBA application written for ArcGIS 9.x (runs in 10.1 with VBA plug-in for ArcMap)

- Migrating to Python with new mapping module in 10.1
  - MapDocument, GraphicElement, TextElement, DataFrame classes all have properties to perform similar functionality
  - Except…

Layout Wizard

Select map to rotate and position:

Map Frame

Check All   Uncheck All

☑ Square map to page
☑ Position map to default location
☑ Position legend to default location
☑ Adjust page size to fit map and legend
☑ Adjust surrounding graphics to page size
☑ Position title block and credit notes
☑ Add trim and folding marks
☑ Clear all guide lines
☑ Add default guide lines

Preliminary version spacing (cm):   6

Page width (cm)   Page height (cm)
          111   71.5

Apply   Cancel

Layout Wizard

- MapDocument:pageSize property is read-only

pageSize (Read Only)	Provides the ability to get the layout's page size. It returns a named tuple with the properties width and height.	tuple

- Solution is to run some ArcObjects code from Python

Natural Resources Canada   Ressources naturelles Canada
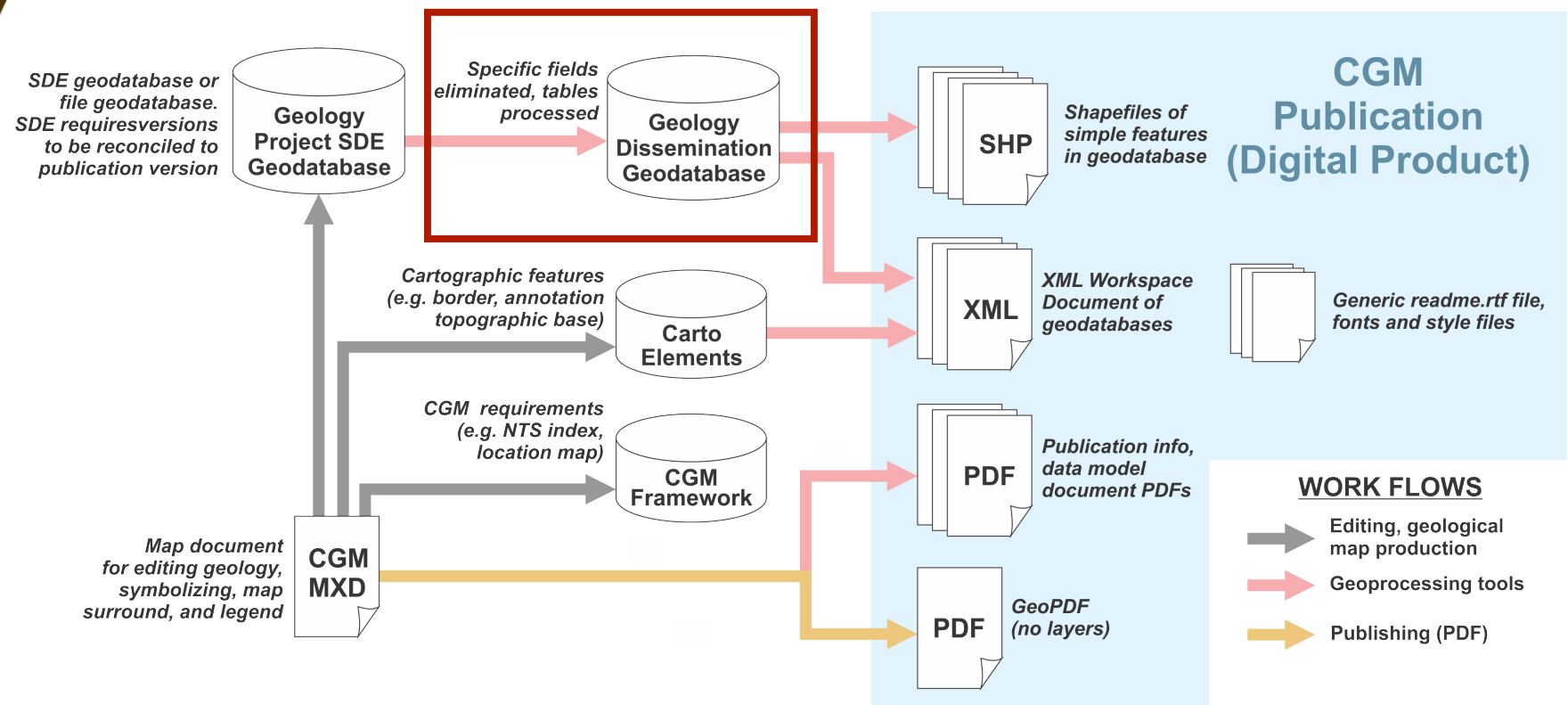
Canada

CGM Publication

- No more print products (offset or on-demand)
- Digital download (zip file from Geogratis)
  - PDFs
    - Map
    - Map information document (source is map)
    - Data model description
  - Shape Files (geology, base, cartography)
  - XML Workspace Document of geodatabases
  - Images, tables and other supporting datasets
  - Symbols (TrueType and style files)
 - Generic readme

Disseminate Data

- Project data copied to temporary file GDB for dissemination (processing, prepare for XML file)

SDE geodatabase or file geodatabase. SDE requires versions to be reconciled to publication version

Geology Project SDE Geodatabase

Specific fields eliminated, tables processed

Geology Dissemination Geodatabase

SHP — Shapefiles of simple features in geodatabase

CGM Publication (Digital Product)

Cartographic features (e.g. border, annotation topographic base)

Carto Elements

XML — XML Workspace Document of geodatabases

Generic readme.rtf file, fonts and style files

CGM requirements (e.g. NTS index, location map)

CGM Framework

PDF — Publication info, data model document PDFs

Map document for editing geology, symbolizing, map surround, and legend

CGM MXD

PDF — GeoPDF (no layers)

WORK FLOWS

→ Editing, geological map production

→ Geoprocessing tools

→ Publishing (PDF)

Disseminate Data Script

- Project area may span more than one CGM publication, therefore data is clipped into separate file GDB
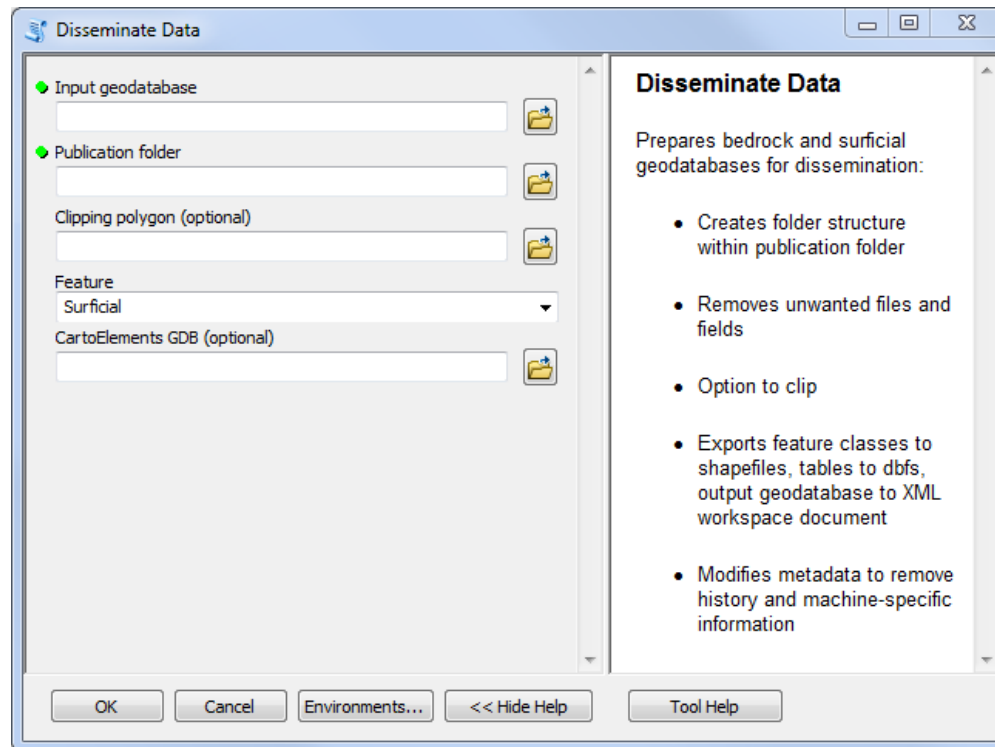
Preparation for XML File

- Local storage information, geoprocessing history, FGDC metadata lineage, and empty elements are removed from temporary file GDB
  - Found to contain connection details, IP addresses, user names, servers, file paths
- Accomplished using XSLT (XML style sheets) Check under ArcGIS installation path:
  `…\ArcGIS\Desktop10.1\Metadata\Stylesheets\gpTools`
- Export to XML Workspace Document
  - Data stored as binary
  - With metadata

Natural Resources Canada   Ressources naturelles Canada

Canada

Future Challenges

- Automate as much map surround information as possible (e.g. descriptive notes, credit notes)
- New application to generate a geological legend
  - Content driven from database
  - Adherence to standard symbology and appearance
- Editing annotation
- Implementing cartographic representation

Thank you

vdohar@nrcan.gc.ca

Natural Resources
Canada

Ressources naturelles
Canada

Canada